FINAL REPORT

Forage-Dairy Systems Analysis

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The Lake States/Upper Midwest dairy/forage farm is a complex system subject to the vagaries of an uncontrollable input - the weather. Research supported by this agreement was focused primarily at developing a better understanding of the dairy/forage farm system and subsystem components and their relationships to the economic status of this type of agricultural enterprise. The impact of alternate management strategies on variables such as net returns to the farm operator, milk prices to consumers, fossil fuel energy use, and fertilizer purchases was studied. The experimental approach taken was to systematically assemble biological, physical and economic parameters from previous studies and develop from this information new computer models and extension of existing models as the basis for subsequent system analyses.

A series of component computer models (and associated parameters) were assembled into a whole farm model that captures significant consequences of interactions among components. For example, the model has been used to evaluate the economics of alternative strategies to hasten field drying of alfalfa and reduce its exposure to weather. Similarly, the model has been used to investigate the impact on average net farm income and its variability, energy use, and chemical use for alternative combinations of alfalfa and corn silage in the animals diet and in the crop mix.

As a frame of reference, the alfalfa crop, in an economic sense, looks better in post-1980 analyses as compared to the early and mid-1970 time period. This is due primarily because of (1) the recognition of the complementarity (rotation effects) between alfalfa and corn silage, and (2) higher energy values that have been credited to alfalfa forage relative to corn and corn silage. Fossil fuel energy inputs are factors also inasmuch as a corn silage crop production system uses almost twice as much fossil fuel as does an alfalfa crop production system when standardized to equal milk production.

Other major achievements of the system analyses include: (1) identification of key components and relationships which describe the production and utilization of forages for use as feedstocks for milk production such as growth, harvest, storage, feeding and utilization; (2) the design, development, and making operational components and a whole farm simulation models of the dairy/forage enterprise, and (3) testing the usefulness of the computer models to evaluate the consequences of new technology and/or the potential consequences of potential technology.

More specifically, these models (component and whole farm) provide a format for evaluating the sensitivity of farm system level economic output to subsystem level technical parameters. Exogenous input models were also developed to provide the input and product prices in the context of an intermediate and longer-duration planning horizon.

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